# ★ OCCUPATIONAL ★ HAZARDS

NOVEMBER 1941

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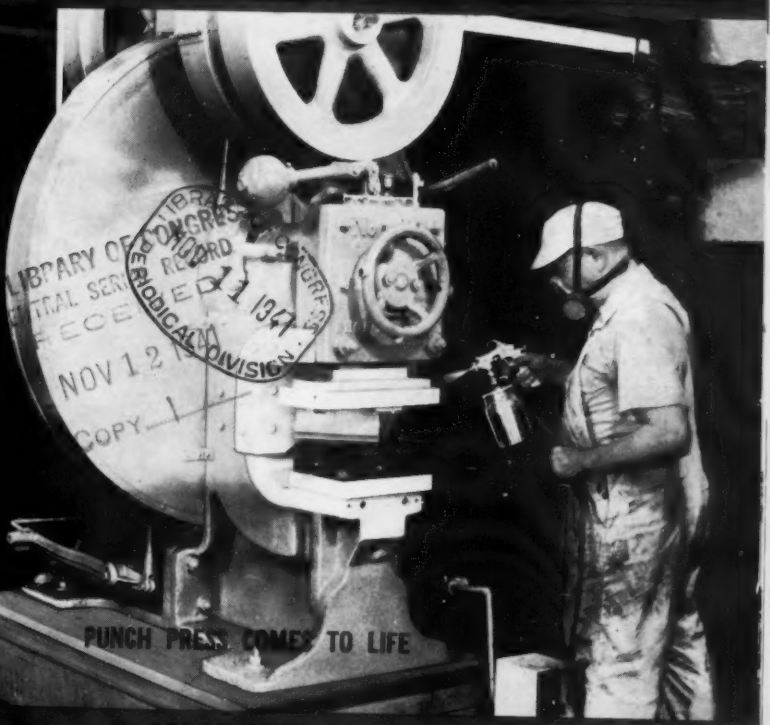


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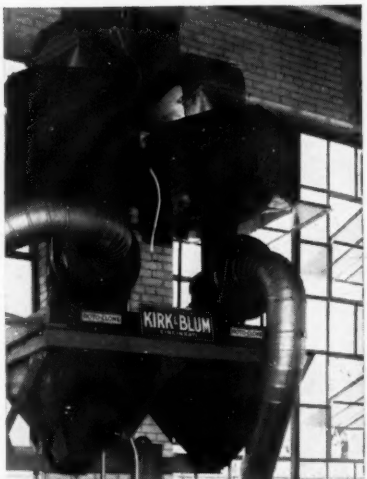


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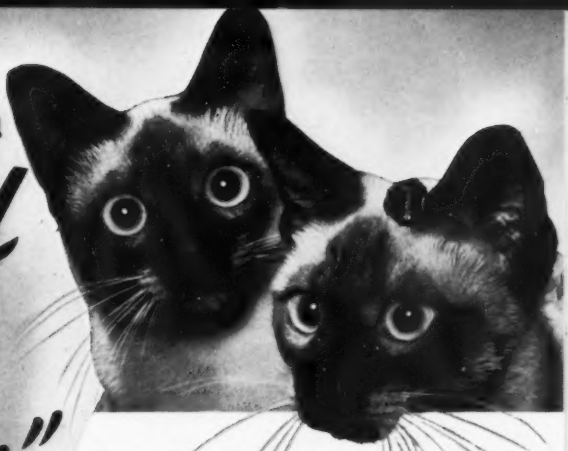

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### Revise Valuable Book

The McGraw-Hill Book Company announces the publication of a revised edition of "Industrial Accident Prevention" by H. W. Heinrich.

Since the original publication of Heinrich's book in 1931 there has been a marked increase in the interest displayed by the average person in the prevention of industrial accidents. Employers especially agree that safety is "good business" and should be included as a worthwhile activity in manufacturing and construction operation. The elements of industrial safety are being taught in high schools and in universities, and in the special engineering defense training courses given under the auspices of the U. S. Department of Labor. Heinrich's book will be used as a text in these courses. New chapters on occupational disease, safety organization, first aid and hospital, and fatigue have been included.

A high-light commentary on the new edition is that it is basically comprehensive. Each separate section covers its subject completely although not too elaborately. For example, the fundamental principles of accident prevention are but three in number. The axioms on which the structure of modern safety work is based are less than ten. There are not over twelve important methods of creating and maintaining interest, two kinds of direct and proximate accident causes, and a half-dozen ways of guarding machines at the point-of-operation. It is pointed out, however, that although the kinds of fundamental facts are relatively few there are numberless variations of each kind.

The value of this listing and cataloguing of essential safety elements lies in its usefulness to the employer, foreman, safety engineer, safety director, student, or other person either contemplating or doing actual accident prevention work. He does not need to rely wholly on his own past experience or his imagination or resourcefulness. He has before him a complete list of all available methods together with examples containing necessary explanatory detail.

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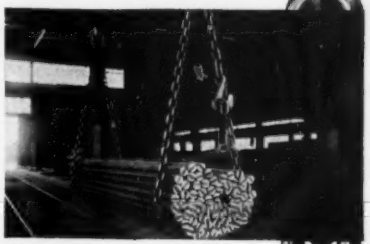

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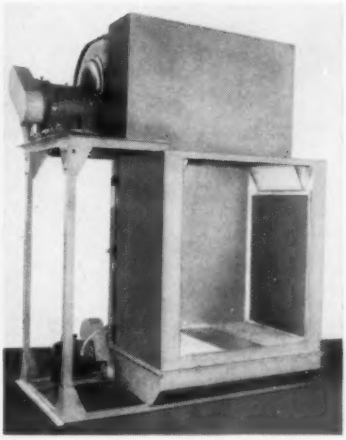

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## Industrial Health in Defense Industries

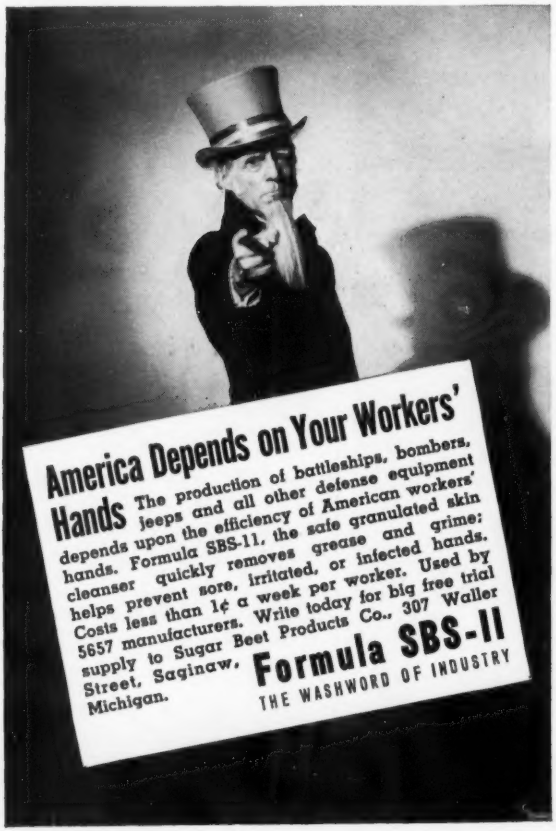
The industrial hygiene division of the New York State Labor Department recently made public its program for co-operating with Government defense contractors on health problems. Expansion, increased production, and new processes all have contributed toward new problems in industrial health. Problems often arise which need the services of highly trained technical men. To meet these conditions, the industrial hygiene division of New York State Department of Labor has organized a well-balanced co-operative program. Summarizing this program, the following services are outlined:

1. Firms having Government defense contracts are sent complete information on the services offered in the field of health.

2. Plants are visited and conditions studied by qualified technicians to determine whether new or old hazards exist.

3. Educational material dealing with specific health hazards is prepared and distributed to all defense contractors.

4. Where indicated, more extensive studies are made of materials and processes.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There's Profit in Prevention

# OCCUPATIONAL Hazards

NOVEMBER 1941

VOLUME 4 NUMBER 2

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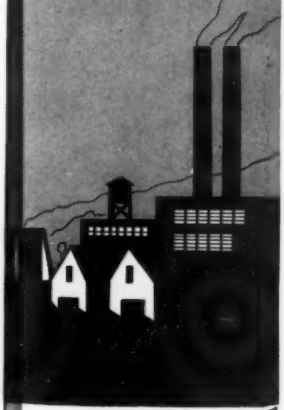
Jack Weiss, Editor



Circulation this issue more than 25,250 copies

BY SUBSCRIPTION, one year, $1.00. Single copies, Ten cents.

Color spotlights working area, increases operating efficiency.

# Color Cuts Costs

IN ORDER to duplicate the conditions existing generally in the machine tool industry, two machines were selected as typical for study. These were a small punch press and a power shear. Another factor influencing this choice was the fact that the area of the working parts is small in comparison to the area that may be painted, thus providing large light-reflecting surfaces.

Since colors are not truly represented under different types of light sources, both incandescent and mercury lighting equipment was installed for the machines under observation.

In order to obtain accurate photometric records of each of the colors tested, readings were taken of light falling on the working surface and light reflected. The important surfaces of each machine were divided into zones, each zone having an area of one square foot.

The original color of the machines was a standard battleship grey, having a very low reflection factor. The paints used in the experiment were semi-gloss, oil-resistant, washable machinery paints. Light colors having good light reflecting characteristics were

***This material has been abstracted from a study developed by the Philadelphia Electric Co. in conjunction with the DuPont Co.***

***This article describes field investigations to determine the effect of color and brightness of surrounding surfaces, on the utilization of light as a seeing tool. Data presented show that the proper selection of color and brightness of machine parts, plus a well-designed lighting system, definitely increase the accuracy of seeing. This increased accuracy is shown to reduce accident hazard, increase production, and produce more comfortable working conditions.***

chosen for the test. The entire machine, with the exception of some of the working parts, was painted. Over a period of several months, the following colors were applied to the machines under observation:

*Shear*

Battleship Grey
Aluminum
Light Green
Light Grey
Light Grey with Dark Green outer surfaces
Light Grey with Medium Grey background
Light Buff with Medium Grey background

*Punch Press*

Battleship Grey
Yellow
Light Blue
Light Buff
Medium Grey with Light Grey background of working zone
Light Buff with Medium Grey background

A series of time studies was also conducted on the shear to ascertain the effect of the various colors upon actual operating efficiency. Three simple jobs were performed, and time study records were kept on each. The first two jobs consisted of cutting a small piece of metal into one-inch strips. For the first job, hereinafter called Job No. 1, this was done by making the measurements on the built-in scales of the machine. For Job No. 2, it was accomplished by lining up scribe marks with the cutting blade. Since the time for the machine to make the cut does not vary, only the

*(Please turn to page 24)*

**Painting vital parts makes this punch press a safer machine to use because of reduced eye fatigue.**

# Heavy Heavy, Hangs Over Thy Head

***Manila rope, chain and wire rope are thoroughly discussed and their relative uses for material handling are outlined.***

**By J. R. COX, Safety Engineer, Fairbanks, Morse & Co., Beloit, Wisconsin**

THERE are only two basic ways of moving materials: either the load is moved in contact with Mother Earth, or we get it into the air and move it.

Modern slings for connecting the load to the moving power may be classified as manila rope, chain and wire rope, stated in order as to age of development. First thing, let me say that treating these three classes as a whole, safe practice demands the use of only the best material available.

The rules on safe practice which should govern the use of all three classes of slings are to keep the slings free from twists, knots and kinks; lift from center of hooks, never on the point; distribute the load evenly on all legs; and inspect the slings frequently.

### Manila Rope

Manila rope is ideal sling material from the viewpoints of flexibility and protection of finished surfaces, but it is more easily damaged than chain or wire rope. It must be protected against dampness, oils, acids and dry rot. The strength of a brand new rope is uncertain unless it has been stored in a dry place well ventilated and free from high and low temperatures.

If stored for a year or more the rope should be on a grated platform so that air has free access to it. A building without heat is a bad place to keep rope since it is subject to dampness during the winter and spring months.

Acid is very detrimental to the life of a rope. Acid damage may occur in transport in a manner which leaves no sign of its presence.

The efficiency of rope and its behavior under certain conditions are fairly consistent. It is commonly assumed that a safe load in tons is equal to the rope diameter squared. Safe practice demands, however, that the strength of the sling after fabrication be considered. The majority of rope

Mr. Cox is a safety engineer of many years' experience. A practical man who knows the answers.

slings are made up endless and this necessitates some kind of a splice. Splicing is quite a trick and should only be entrusted to an experienced splicer. In most shops there are only a few men who are competent to make a safe splice. When the rope is to be used for an endless sling the short splice is used and the new sling can be assumed to have 80% of new rope strength. Complete data on rope splices and full information on fiber ropes is available in Safe Practices Pamphlet #6 National Safety Council.

**Different Conditions**

There are so many different conditions encountered in the use of ropes, for instance, whether it is 6, 9, 12 or 15 yarns, whether it is an endless type sling or hook and eye type, whether it is pure manila fiber or a mixture of manila and hemp, what is the angle of the hook-up, etc., that it is not advisable to try and quote safe loads. As an inspection routine I should recommend that new rope be carefully examined before being put into use and thereafter at intervals not exceeding thirty days while it is in use. Visual inspection should mean inspecting the rope throughout its entire length for external wear, cutting of fibers, displacement of yarns or strands, discoloration, etc. The following procedure will be of assistance in the inspection of rope:

1. Look for abrasions and broken fibers on the outside.

2. Inspect the inner fibers by untwisting the rope in several places. If the inner yarns are bright, clear and unspotted, the rope strength has been preserved to a large degree.

3. Unwind from the rope a few strands of yarn about 8"long and break it with your hands. If the yarn breaks with little effort, the rope is unsafe.

4. Rope used around acid or caustic should be inspected frequently. Some make a daily inspection. If black or rusty spots are noted make the hand-break test and discard rope that is questionable.

5. In general a rope that has lost its feel of pliability or stretch or in which the fibers have lost their luster and appear dry and brittle, should be viewed with suspicion and be replaced by a new rope, especially if it is being used where breakage would endanger workers.

**Don'ts**

1. Don't put pressure on rope around a sharp corner. Pad well when such a hook-up is necessary. Incidentally there is a company that sells a rawhide sleeve which slips over the rope and protects certain portions of the sling against abrasion.

2. Don't allow dirt, oil and grease to remain on a rope, wash with clear water under pressure.

3. Don't put a wet rope away from air, let dry in free circulation.

4. Don't use a frozen rope, its strength is greatly reduced.

5. Don't leave ropes lying around on floor where they will pick up dirt and grease. Have places to hang them up and see that they are put there.

6. Don't try to get too much "mileage" out of a rope. Rope is not expensive enough to justify taking chances.

*(Please turn to page 28)*

# Right off the Docket

**The trend of litigation on workmen's health and accident compensation is reflected in these briefs of the latest and most representative cases coming to trial in the intervals between issues. Familiarity with this trend is important to every industrialist.**

### *Pneumonia Called Injury by Accident*

A truck driver for a road building company developed pneumonia. He claimed the disease was caused by the inhalation of excessive gas and fumes from the motor of the truck. The company claimed there was no accident and consequently there should be no award.

The evidence revealed that the employee was furnished with an old defective truck that emitted considerably more gases and fumes than any other truck on the job. It was shown that the breathing of these excessive fumes by the truck driver precipitated the activity of the pneumococci germs and resulted in pneumonia.

The Court held that since the breathing of gas and fumes does not ordinarily cause pneumonia, and since this employee was subjected to unusual and extraordinary conditions and hazards, the pneumonia which he contracted, under these circumstances, constituted an "injury by accident," and was compensable.

*Stevenson* vs. *Lee Moor Contracting Co.* (New Mexico) 115 Pac. 2nd 342 (July-1941)

### *Court Affirms Silicosis Award*

The employee worked twenty-three years as a coremaker. His work required him to handle and work with sand. He developed silicosis and claimed it was due to the dust particles from the sand. The company contended that the sand used was of course grain, and that core oil and corn flour were mixed with it before handling, and that it gave off no dust.

The Court said that there was sufficient evidence on the question of the sand dust containing silica to support the award granted by the Industrial Commission.

There was some dispute as to the medical facts in this case. The Court stated the following rule with respect to such dispute: "The Industrial Commission, in determining whether an employee has silicosis, should consider the occupational history of the employee, his physical condition, the X-Ray readings, the opinions of the medical experts, and other competent evidence tending to prove or disprove disablement caused by silicosis."

*National Malleable & Steel Castings Co.* vs. *Industrial Commission, et al* (Illinois) 36 N.E. 2nd 249 (June-1941)

### *Death From Heart Strain Compensable*

The wheel of a heavy furnace pot became caught in an irregularity in the floor, requiring the furnace man to exert unusual strain to extricate it and move it to its proper position. After doing so the furnace man started ladling from the pot, but almost immediately withdrew to the office, a few feet distant, where he died from heart failure in some 12 to 15 minutes. The employee's heart had been impaired by

disease prior to this happening, and it was found that the physical effort exerted in moving the furnace pot was an excessive and accidental strain of the heart, entitling the employee's widow to compensation for his death.

The rule governing this type of case was stated by the Court, as follows: "Where the performance of manual labor in course of employment entails a strain upon the heart without which death would not have occurred but in consequence of which, combined with causes disassociated with the employment, death occurs, the labor resulting in strain constitutes an 'accident' within the meaning of the Employer's Liability Act."

*Molnar* vs. *American Smelting & Refining Co.* (N.J.) 21 Atl. 2nd 213 (July-1941)

***Compensation Given for Neurosis Resulting from Accident***

A coal miner slipped while pushing a loaded car of coal, and suffered an abdominal pain. For a year he was unable to work complaining of pain in his side. Examination failed to reveal any physical impairment. Finally an exploratory operation was performed. The operation disclosed nothing, but following it the miner no longer was disabled. This evidence warranted an award of compensation. It was held that the miner suffered an accidental injury which caused a traumatic neurosis, disabling him until the performance of an exploratory operation.

*Holobinko* vs. *Moshannon Smithing Coal Co.* (Penn.) 21 Atl. 2nd 440 (July-1941)

***Hernia Case***

The plaintiff, a fifty year old weaver, sustained a hernia when he threw his whole weight against his loom in order to stop it. Previously, the plaintiff had had a hernia condition, and been operated on for it. The defendant claimed that the hernia for which compensation was asked had been present and was not due to the strain in stopping the loom.

The Court rejected this defense. It stated, that under the statute relating to claims for compensation for hernia, a claimant could not be deprived of compensation because of having a predisposition to hernia or because an operation to repair a pre-existing hernia weakened the abdominal wall so that accident or unusual strain was more likely to result in new hernia than if there had been no previous operation.

*Henderson* vs. *Graniteville Co.* (South Carolina) 15 S.E. 2nd 637 (June-1941)

***Heavy Lifting Ruptures Ulcer***

Employee, a laborer, in lifting boxes weighing between 100 and 150 pounds each, felt a sudden, sharp, cramplike pain in his abdomen. He felt faint and nauseous, and was compelled to cease work and return home. On examination by a physician he was found to be suffering from internal bleeding due to a ruptured ulcer. About an hour before the employee lifted these boxes he had been examined by a physician and appeared to be in normal health.

These facts, the Court held, warranted an award of compensation on the ground that the employee sustained injury in an accident which arose out of and in the course of employment, since rupture of the ulcer and ensuing hemorrhage were causally related to the lifting effort.

*Hickey* vs. *Hoffman Beverage Co.* (N.J.) 21 Atl. 2nd. 632 (July-1941)

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# Standard Protects Workers In Electroplating Operations

***Suggested exhaust system construction, personal protection equipment are discussed in new code.***

ANOTHER American Standard in the industrial hygiene field became available for use by industry through the recent approval by the ASA of the American Standard for Safety in Electroplating Operations.

This new standard outlines requirements for the protection of workers in those electroplating operations which may injure the health of operators through contact with gases, mists, or liquids. It applies to electroplating and deplating operations and to the anodizing of metals, and describes standard exhaust systems and methods for personal protection of the operator. Other requirements for electroplating and deplating processes, and uniform practices for the conduct of the work in order to reduce possible hazards to health are also given.

No figures are available which would indicate the amount of plating work carried on by the industry, but certainly electroplating is one of the most widely used processes. Chromium plating, arsenic plating, copper, brass, bronze, zinc, cadmium, tin, silver, gold, nickel plating, and lead plating are done in a variety of industries and for a variety of purposes. The defense program promises to bring about an even more extensive use of the process and many more workmen will, therefore, now be exposed to the hazards involved. The approval and publication of the standard is therefore especially timely.

### Degree of Hazard Shown

Electroplating systems are classified in the standard according to the degree of hazard associated with them. Chromium plating and arsenic plating, for instance, are placed under the severe hazard classification. Cyanide solutions for plating copper, brass, bronze, zinc, and cadmium, tin plating from alkaline baths, anodizing aluminum and deplating operations that evolve gases are placed under the moderate hazard classification. The slight hazard classification includes cyanide solutions for plating silver and gold and acid or neutral solutions for plating copper, zinc, nickel, and lead. The degree of protection required for each of the classifications is specified.

Three sections of the standard contain the basic recommendations, covering specifications for exhaust systems, personal protection, and inspection and maintenance.

The section on exhaust systems sets up the criterion for safety that an exhaust system shall be so constructed and operated that the concentration of toxic materials in the air inhaled by the operators shall not constitute a health hazard. Suggestions for attaining this criterion are included in the appendix to the standard. The section continues with specifications for duct systems and refers to the Report on Fundamentals Relating to the Design of Exhaust Systems published by the American Standards Association. Air-cleaning devices, the discharge stack, and the sources of suction are discussed.

### Protective Clothing Is Required

Under the section on personal protection, the use of rubber boots or wooden-soled shoes, rubber aprons, and elbow-length rubber gloves is required for all persons who come in bodily contact with plating solutions. Goggles conforming to the American Standard Safety Code for Protection of Heads, Eyes, and Respiratory Organs of Industrial Workers (Z2-1938) are specified for use whenever there is danger of splashing of plating solutions. Rinsing water to use in emergencies to wash solutions or acids from the body is provided and a requirement is included that petrolatum or some other suitable ointment shall be furnished for use in coating the nostrils to prevent irritation of the membranes by chromic acid mist.

One of the most interesting and valuable sections of the standard is the Appendix. It has been written with the aim of presenting constructive suggestions for putting into effect the basic principles set forth in the body of the standard. The appendix points out that while threshold limits have not been accurately defined for all of the toxic materials used in industry it is believed that if the degree of exhaust ventilation maintained is sufficient to keep the concentration of such substances in the atmosphere below one milligram in ten cubic meters of air (a figure which has tentatively been set for chromic acid), a safe working atmosphere will be obtained. The figure for chromic acid just cited has been generally accepted for a number of years and has been tentatively set by the committe on toxic dusts and gases as the proposed American Standard Allowable Concentration of Chromic Acid.

Important details in the design of plating tanks and of the exhaust system for such tanks are given. It is recommended that for Class I electroplating processes each exhaust manifold should exhaust at least 120 cubic feet per minute per square foot of tank area. An equa-

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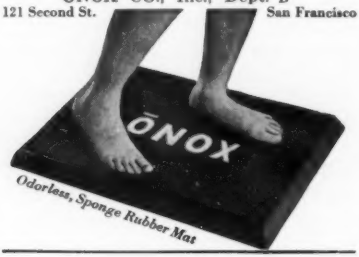



tion for computing the air to be exhausted is provided.

While the standard has been limited to actual electroplating operations, the appendix points out that tanks for pickling, cleaning, bright dipping, and galvanizing may produce hazardous atmospheric pollution and that it will frequently be necessary to ventilate tanks containing acids, alkalies, or organic solvents. The limitation of the standard to electroplating was not intended to imply that other operations were not also potentially hazardous. Many of the criteria in the standard for electroplating tanks can be applied directly to other tanks.

While the standard represents the combined technical points of view of the subcommittee which drafted the standard and of the ASA sectional committee on exhaust systems which reviewed and approved the standard for submittal to the ASA, it also represents or reflects the methods used in a large number of industrial plants throughout the country. A questionnaire designed to obtain information regarding present practice in typical plating plants and the measures employed by such plants in the elimination of potential hazards to health, needed by the subcommittee for drafting purposes, was sent to 150 representative firms conducting electroplating.

### Real Interest Shown

The draft of the proposed standard was revised five or six times by the subcommittee before consideration by the full sectional committee by correspondence and in meeting. The approval by the ASA therefore can truly be said to represent a real consensus of those interested in and affected by the standard. Doubtless, however, new techniques, new materials, and new forms of electroplating which may be introduced in the future will dictate the need for future revisions of the standard.

The standard is now on the press and copies may be ordered through the Editor, Occupational Hazards Magazine, 812 Huron Rd., Cleveland, Ohio.

# LEHIGH CORRECTS A SORE SPOT IN SAFETY SHOE FIT

**PUT YOUR FINGER** on the side of your foot, near the sole. That's the cuboid bone. Rub it, note its sensitivity to chafing and pressure. That's because it has no protective fleshy cushion.

**IN ALMOST ALL** safety shoes, a seam at the side strikes right over this sensitive area. (See "A" in "glass shoe" photo). Because this seam chafes and presses, some men can't wear safety shoes comfortably, refuse to wear 'em.

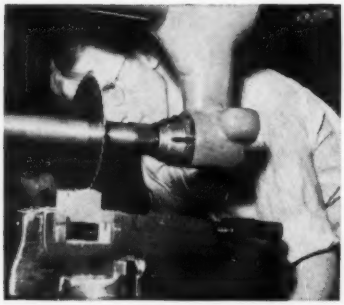
**PUTTING THE FINGER** on this sore-spot, Lehigh moves the seam back a full inch (see "B") so it clears the cuboid entirely. A long step forward in comfort!

**IT'S EASIER** to sell foot safety in your plant when you can offer your men real comfort along with "bombproof" toe protection. This improved construction is exclusive with Lehigh!

**TRANSPARENT** upper shows how seam clears the cuboid area in new Lehigh safety shoes.

**STOCK No. 857** featuring new set-back seam.

**LEHIGH SAFETY SHOE CO., Inc., Allentown, Pa.**



# Safe Jobs for Y

By S. W. Homan
*Children's Bureau, U. S. D*

WITH "Help Wanted" again the national password, employers are relaxing voluntarily maintained employment qualifications. Age limits, especially, are being raised at one end and lowered at the other. The result is the tapping of a great labor reservoir of young workers, who in the past decade could not find jobs because their fathers and older brothers had more experience, strength, and skill to offer.

The influx of new, young workers into defense plants and industry generally is not without significance to the industrial safety and health movement. Industrial accidents are up by some 20 per cent. This increase is attributable to the employment of many new workers unfamiliar with the hazards of industrial operations, to the lack of instruction in safe work practices, to the greatly accelerated pace of production, and to the overcrowding of plants due to sudden and abnormal expansion of the labor force. Many youths have gotten their first jobs in industry, but these new workers have not yet learned to cope with the hazards of industrial employment.

**Young men are being trained for many s is a boom to the Def**

The weight of expert opinion is that young workers are more prone to industrial accidents and disease than are mature employees. As a rule young workers have less maturity of judgment, a lesser degree of muscular co-ordination, and less

# for Young Workers

. W. Homa and Saul Wallen
Bureau, U. S. Department of Labor

ned for many skilled tasks. Their conscientiousness
oom to the Defense Program.

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resourcefulness in meeting emergencies than older men and women. Furthermore, their greater recklessness and natural curiosity impel young people to take chances or commit acts that more prudent and experienced workers would avoid.

**Susceptibility**

Similarly, in the field of occupational disease, expert opinion points to the greater susceptibility of young workers. Most observers since the early days of industrial hygiene have considered young persons especially susceptible to lead poisoning. The prevalance of fatal cases of phosphorus poisoning among young persons suggested less resistance than in older individuals. During the World War exposure to TNT poisoning, indicated that more young persons succumbed more rapidly than those more mature.

Dr. Alice Hamilton, reviewing her long experience in industrial hygiene, stated that "it is safe to conclude that boys and girls are more susceptible to industrial poisons than are grown people."

The problem facing manufacturers, confronted on the one hand by a shortage of labor and on the other by an increasing rate of industrial injuries, is to tap this hitherto little-used reservoir of young workers.

The principle of restricting youth to jobs that they can fill without

Lanolin Oil in a
powdered hand soap . .
that's LAN-O-KLEEN*
ASK YOUR PLANT DOCTOR WHAT HE THINKS OF THE IDEA
* Reg. U. S. Pat. Office.
WEST
DISINFECTING CO.

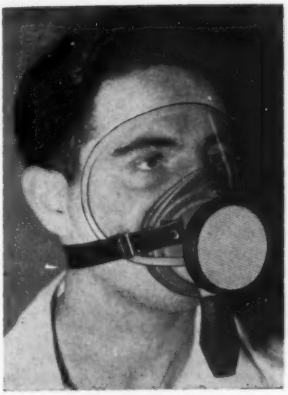
undue risk of an injury which may alter their whole lives is being put into action by the Children's Bureau of the United States Department of Labor. The vehicle for action is the child-labor provisions of the Fair Labor Standards Act of 1938.

That act, which establishes 16 years as the minimum age for general employment, seeks to protect workers between 16 and 18 years of age from employment in occupations "particularly hazardous for the employment of children between such ages or detrimental to their health or wellbeing. . . ." It provided that the Chief of the Children's Bureau "shall find and by order declare" such occupations to be particularly hazardous; these orders have the effect of establishing a minimum age of 18 years for the occupations they cover. The act applies to employers engaged in the production of goods that are shipped or delivered for shipment in interstate commerce.

**Thorough Study**

Determination of hazardous occupations are made after careful investigation of the occupations to be covered by a proposed order. During such an investigation, trained personnel gather statistical data on industrial injuries, visit typical plants to observe the occupations and their hazards under actual operating conditions, and seek the opinion and advice of safety engineers, plant supervisors, trade-association officials, union leaders, and State factory inspectors, as well as experts from industrial-accident commissions and agencies of the Federal government. A report is prepared on the basis of the investigation and together with a draft of a proposed finding and order, is submitted for criticism and suggestion, to a technical advisory committee appointed from the ranks of employers, workers, and experts in the particular field under consideration. After issuance and publication of the proposed finding and order, opportunity is given for any interested party to make objection to or suggest revisions in the order at a public hearing if desired. Objections and suggested revisions are carefully considered, and if they are found to be justified, the proposed order is revised. Thereafter, the order is adopted and issued by the Chief of the Children's Bureau. Once issued, the orders have the force of law, and a violation of their provisions constitutes a violation of the child-labor provisions of the Fair Labor Standards Act.

The Children's Bureau of the United States Department of Labor is charged with performing a highly specialized safety job in a narrow but important field. Its job of



**EYESHIELD RESPIRATORS**

Combines Cellulose-Acetate Eyeshield with Pulmosan Respirators, giving extra protection for eyes against particles, splashes, sparks. Non-fogging, non-flammable, can not twist or scratch. Get details.

**SAFE WORKERS**
***are Better Producers!***

Workers haunted by fear of accidents—or exposed to health hazards—can not work at top efficiency. Today's Defense production calls for healthy, energetic, alert workers—kept safe and worry-free by proper accident prevention and health protective equipment. Is YOUR safety equipment adequate for increased payrolls and extra shifts? Check up—then write Pulmosan for immediate service on any problem or product for safety. If it's for Safety—we have it!

*Write for Complete Catalog*

**PULMOSAN**
**SAFETY EQUIPMENT CORP.**
Dept. OH, 176 Johnson St., Brooklyn, N.Y.


sorting out the safe from the unsafe jobs for young people under 18 years of age is important both to industry and to community welfare. Its progress in this task will be outlined in a subsequent issue.

## New Manager

Fred C. Wood has just been appointed manager of the air conditioning department of the York Ice Machinery Corporation. He will devote his attention to the application of industrial air conditioning to such vital defense production as aircraft manufacturing plants, blast furnaces, industrial processing, laboratories, testing rooms and precision manufacturing, in addition to regular civilian air conditioning requirements.

Mr. Wood was born in Hamilton, Ohio, in 1905, was graduated with a degree in mechanical engineering from Cornell University and entered the York Ice Machinery Corporation as a student engineer in 1928.


**VITAMINS . . .**
***A New Industrial Tool***

In a new 22 page booklet the vitamin idea is clearly explained in plain, understandable language.

Vitamins can be made to fit into your fatigue-reducing program.

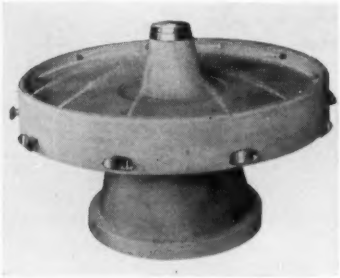
WRITE FOR THE EXHAUSTIVE BOOKLET OUTLINING NEW VITAMIN PLAN.

**★ The INDUSTRIAL VITAMIN CORP.**
First National Bank Bldg., St. Paul, Minn.

# New ... IN THE ...

NEW INDUSTRIAL WASHFOUNTAIN—The new line of "Mercury" industrial group washfountains recently announced by the Standard Washroom Equipment Company, 1000 South Niagara Street, Saginaw, Michigan, embodies a number of new and very practical features.

These washfountains, available in either 36" or 54" diameter, are made of pre-cast stone and are heavily re-enforced.



The manufacturer claims an innovation in the "No-splash" feature of this equipment. On all models water is introduced through ten small individual spray-heads, equally spaced about the inside edge of the rim of the fountain lowl. It is claimed that this design prevents water from splashing over the rim onto the person washing.

It is also claimed that because the sprayheads are in the bowl rim instead of in the center post, that it is not necessary to bend over the bowl to wash and hence ten workers (instead of 8 or 9) can easily wash at one time.

"Leg Control" is available on one model. A metal pad projects through the rim of the fountain directly under the sprayhead which it operates. Pressure on this pad by the leg of the person washing turns on the water. The instant pressure on the pad is released, the water automatically shuts off.

"Individual Control" models are water-savers also. By a half-turn of any sprayhead the water from that head is turned on, and vice-versa. "Single Control" fountains feature a single valve to operate all sprayheads.

Water in all models is used only after it has passed through an automatic temperature control valve.

The manufacturer states that the "Mercury" washfountains are easy to install and maintain. All plumbing is readily accessible, but completely disclosed from view.

Powdered, liquid, or bar soap equipment is available for attachment to all models.

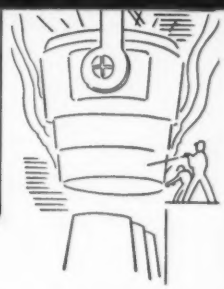
Literature describing all models may be had by writing the manufacturer, address above.

SOLES AND HEELS—Soles and heels made from its new synthetic rubber, Ameripol, are announced by The B. F. Goodrich Company, Akron, Ohio.

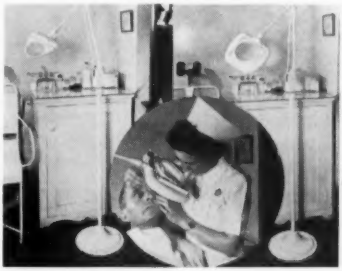
The synthetic rubber soles and heels, the company points out, have special advantages for wear where there are oils, greases, gasoline, naphtha and other rubber solvents present.

It is claimed that Ameripol not only resists the deteriorating effects of these natural enemies of rubber and is relatively unaffected by them, but has a high resistance to abrasion, and successfully resists flex cracking.

# ew Ideas
# THFIELD



NEW MODEL SUPER SIGHT—A new model, more compact Super Sight is announced by The Boyer Campbell Company, Detroit, Michigan.



The new bracket has been adapted to the larger model, which was introduced a year ago for first aid work, removing particles from eyes, splinters from fingers, etc. This older model is adaptable where a magnifying glass with a larger field is desired and where space is not at a premium. Both models give magnification and light where needed, providing magnifying lens and light on-unit and are moved about with finger-tip control.

Either model comes in a choice of 2-bracket applications, one that may be attached to the arm of a chair or table and the other mounted on a pedestal as illustrated.

NOISE REDUCER—For reducing the detrimental effects of noise upon workers, the Mine Safety Appliances Company announces a new product—The M. S. A. Ear Defenders.

The use of M. S. A. Ear Defenders reduces loud noises by 35-45 decibels or to about 1/10 their former loudness, yet are so designed that warning signals and conversation can easily be heard. A resulting effect from the reduction of noise enables workmen to better concentrate on their jobs and thereby increase their efficiency.

M. S. A. Ear Defenders were scientifically designed, after long research and experiment, by Dr. Bern O. Knudsen, a recognized authority on Acoustics, Professor of Physics at the University of California at Los Angeles, and Dr. Carey P. McCord, Medical Director, Industrial Health Conservancy Laboratories, Detroit, Michigan.

Essentially, each MSA Ear Defender is a tapered tube molded from surgical-type soft rubber; consisting of two barriers, an outer one of metal and an inner one of soft rubber, separated by an air space. This tapered construction permits easy insertion and removal without any danger of coming in contact with the ear drum. They are easily cleaned for re-use.

Bulletin No. HA-1 describing the MSA Ear Defenders in detail may be secured free, on request to this maga-

zine or direct to Mine Safety Appliances Company, Pittsburgh, Pa.

NEW LINE OF 2300-VOLT STARTERS—A new line of 2300-volt 60-cycle general purpose starters especially designed for protection against short circuits and overloads has been announced by the Industrial Control Division, General Electric Company, Schenectady, N.Y. Composed of an oil-immersed contactor with self-cleaning copper tips, wide metal bearings, and copper-braided shunts for long life, and the new EJ-2 current-limiting fuses for short circuit protection, the control and bus structure is completely metal-enclosed for compactness, easy installation, and safety.

These starters afford complete protection against short circuits by the use of EJ-2 current-limiting fuses, which limit short circuit current in less than ¼ cycle, and open in less than ½ cycle. These fuses have a disconnect feature which makes possible the complete isolation of an individual starter without causing the entire motor line to be shut down.

DUPOR No. 1

Miniature nose mask — weighs less than 1 ounce — provides 9 sq. in. filtration — sells $12 dozen — sample $1 post paid.

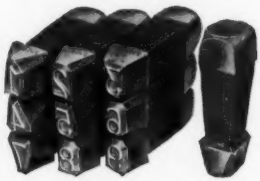
*"The Noblest Motive Is The Public Good"*
*—VIRGIL*

This immortal quotation most certainly was not directed to the employers of those who work in silica dusts. Yet—if Virgil could live today, he would see his words exemplified in thousands of industrials who supply their employees with DUPOR Respirator protection. Write for catalog!

**H. S. COVER**
**MASKS · GOGGLES**
36 Chippewa St., South Bend, Ind.

**FOR MORE SAFETY!**

**use SAFETY Wedge Grip Letters and Figures**



Pat. No. 2,089,794

**SAFETY WEDGE GRIP STAMPS**

are constructed for use on the toughest stamping jobs. The Wedge design enables them to stamp deeper with a lighter blow and with less fatigue. Knurled sides assures a positive grip at all times.

**WILL NOT SPALL OR MUSHROOM!**

Can be furnished with any size character from 1/16" and up. For the maximum of service and safety use SAFETY WEDGE GRIP STAMPS.

*Write for prices and literature.*

**M. E. CUNNINGHAM CO.**
91 E. Carson St. Pittsburgh, Pa.

# Vitamins

## A New Industrial Tool

Vitamins are beginning to find their way into the industrial diet. Today with industrial man-power at a premium, any device that can help keep such man-power intact bears looking into.

Mr. Leighton Wilkie, President Continental Machines, Inc., Minneapolis, Minnesota decided to give the vitamin idea a whirl with his 400 employees. Vitamin pills were given to these workers during the severe winter months.

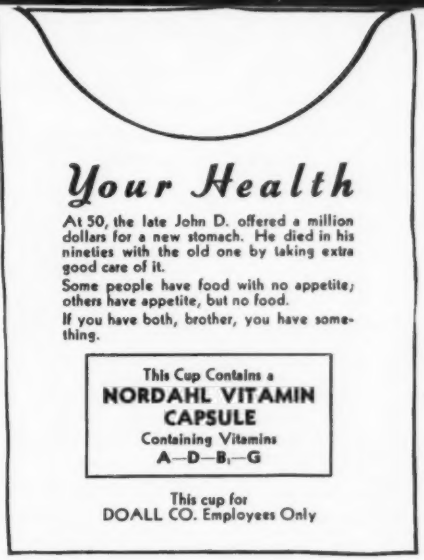
Mr. Wilkie points out that out of 400 employees, there were at no time up to the Spring season more than 8 absent at a time from sickness due to colds, which is a much better record than the percentage of absentees in previous years.

Here is his description of the plan.

"We purchased a large quantity of flat folding paper cups on which we have had printed, "Your Health." Under this heading appears a short, snappy paragraph on some important phase of health preservation and cultivation.

"At the bottom of the paper cup is printed the following statement: "This contains one capsule which may be taken internally to add essential vitamins to diet. The Management."

"We distribute one of these prepared cups to each of our 400 employees at 10:30 each morning. That is a convenient time because then there is the 10-minute relaxation period which has been in force for several years. The short paragraph on the paper cup changes every day so that is a new attention-arrester each day. To start the thing off, we had our company doctor write a bulletin on these vitamins, which was placed in pay envelopes. Then we issued another bulletin with the first distribution of capsules."


Your Health
At 50, the late John D. offered a million dollars for a new stomach. He died in his nineties with the old one by taking extra good care of it.
Some people have food with no appetite; others have appetite, but no food.
If you have both, brother, you have something.
This Cup Contains a
NORDAHL VITAMIN CAPSULE
Containing Vitamins
A—D—B1—G
This cup for
DOALL CO. Employees Only

"Some of the short paragraphs on the paper cups include:

"If you can walk to and from work, leave the car in the garage and you will both last longer.

"The difference between natural and emotional fatigue is that a good night's sleep will take care of the former.

The cost of the whole project was around $500 for a period of 90 days for a force of 400 men. This paid for itself several times over in greater productivity from more alert men and through reduced absence due to sickness of urgently needed men.

## Paint—*from page 7*

total time for each operation was taken. In conjunction with Job No. 2, a third time study was made of the time taken to make scribe marks. All these jobs were performed by an experienced operator, and the times were recorded under both the mercury and incandescent light for each color. Due to shop operating conditions, it was not

TABLE I—Results of Questionnaire, Incandescent Light

| Question | Answer | Yellow | Light Blue | Light Buff | Med. Grey Light Grey | Alumi-num | Light Green | Light Grey | Light Grey Dark Green |
|---|---|---|---|---|---|---|---|---|---|
| 1. Is paint more or less tiring than original? | More | 100% | 28.6% | 0% | 0% | 25% | 12.5% | 0% | 22.2% |
| | Less | 0 | 71.4 | 28.6 | 25 | 50 | 12.5 | 12.5 | 0 |
| | No diff. | 0 | 0 | 71.4 | 75 | 25 | 75.0 | 87.5 | 77.8 |
| 2. Can you see better than with original? | Yes | 50 | 100 | 100 | 87.5 | 100 | 100 | 100 | 77.8 |
| | No | 25 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | No diff. | 25 | 0 | 0 | 12.5 | 0 | 0 | 0 | 22.2 |
| 3. Can you work faster than with original? | Yes | 0 | 67 | 57.2 | 75 | 80 | 14.3 | 87.5 | 77.8 |
| | No | 60 | 0 | 14.3 | 0 | 0 | 0 | 0 | 0 |
| | No diff. | 40 | 33 | 28.5 | 25 | 20 | 85.7 | 12.5 | 22.2 |
| 4. Is it easier to do better work than with original? | Yes | 0 | 75 | 57.2 | 75 | 80 | 14.3 | 87.5 | 77.8 |
| | No | 83.5 | 0 | 14.3 | 0 | 0 | 0 | 0 | 0 |
| | No diff. | 16.5 | 25 | 28.5 | 25 | 20 | 85.7 | 12.5 | 22.2 |
| 5. Do you need more light? | Yes | 60 | 60 | 85.7 | 87.5 | 100 | 100 | 100 | 100 |
| | No | 40 | 40 | 14.3 | 12.5 | 0 | 0 | 0 | 0 |
| 6. Do you think it's safer than before? | Yes | — | 100 | 100 | 87.5 | — | 100 | 100 | 88.9 |
| | No | — | 0 | 0 | 12.5 | — | 0 | 0 | 11.1 |

Example in reading table: Of those of whom question #2 was asked for the Yellow paint; 50% answered Yes, 25% answered No, and 25% said that there was no difference.

TABLE II—Results of Questionnaire, Mercury Light

| Question | Answer | Yellow | Light Blue | Light Buff | Med. Grey Light Grey | Alumi-num | Light Green | Light Grey | Light Grey Dark Green |
|---|---|---|---|---|---|---|---|---|---|
| 1. Is paint more or less tiring than original? | More | 100% | 42.8% | 0% | 0% | 25.0% | 12.5% | 0% | 22.2% |
| | Less | 0 | 42.8 | 28.6 | 25 | 37.5 | 12.5 | 12.5 | 0 |
| | No diff. | 0 | 14.4 | 71.4 | 75 | 37.5 | 75 | 87.5 | 77.8 |
| 2. Can you see better than with original? | Yes | 37.5 | 100 | 100 | 87.5 | 71.5 | 100 | 100 | 77.8 |
| | No | 25.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | No diff. | 37.5 | 0 | 0 | 12.5 | 28.5 | 0 | 0 | 22.2 |
| 3. Can you work faster than with original? | Yes | 0 | 67 | 57.1 | 75 | 60 | 85.7 | 87.5 | 77.8 |
| | No | 60 | 0 | 14.3 | 0 | 20 | 0 | 0 | 0 |
| | No diff. | 40 | 33 | 28.6 | 25 | 20 | 14.3 | 12.5 | 22.2 |
| 4. Is it easier to do better work than with original? | Yes | 0 | 75 | 57.1 | 75 | 80 | 85.7 | 87.5 | 77.8 |
| | No | 84 | 0 | 14.3 | 0 | 0 | 0 | 0 | 0 |
| | No diff. | 16 | 25 | 28.6 | 25 | 20 | 14.3 | 12.5 | 22.2 |
| 5. Do you need more light? | Yes | 80 | 100 | 100 | 87.5 | 100 | 100 | 100 | 100 |
| | No | 20 | 0 | 0 | 12.5 | 0 | 0 | 0 | 0 |
| 6. Do you think it's safer than before | Yes | — | 100 | 100 | 87.5 | — | 100 | 100 | 88.9 |
| | No | — | 0 | 0 | 12.5 | — | 0 | 0 | 11.1 |

Example in reading table: Of those of whom question #2 was asked for the Yellow paint; 37.5% answered Yes, 25% answered No, and 37.5% said that there was no difference.

possible to obtain similar production records for the punch press.

**Results of Tests**

From the nature of the problem, is was to be expected that results secured would be qualitative rather than quantitative.

The results of the questionnaire are shown in Tables I and II. While such figures, particularly when confined to a period of a few weeks, are not conclusive, they do indicate that lighter-colored machine finishes of various hues possess definite advantages which deserve more extensive investigation.

**Summary**

A study of the above tables would seem to indicate that for this operation, light buff is the most suitable color where the material under fabrication is iron or steel, with light grey a close second. From the psychological angle, light blue offers possibilities which should not be overlooked. When these figures were laid before the supervisory force for criticism, the *main comments* were that while from a theoretical standpoint the idea was good from the purely maintenance angle it was not practical to paint machines such a radical color as light buff. Accordingly, as a compromise, all machines were painted a medium grey with light buff around the working area. The purpose was to utilize the luminous possibilities of the lighter finish and still satisfy maintenance requirements. Surprisingly, the combination seemed to perform better than any of the solid colors.

The above color arrangement has been in use since September, 1939.

VENTILATION AND FUME CONTROL IS EASIER
With Flexaust Blower Hose
3" to 28" Diameters
Several Constructions
Write for particulars
HERSEY & COMPANY, INC.
2027 Minor No., Seattle, Washington


During the period of operation we have found the mechanics so convinced of its benefits, that they keep the light area clean without immediate supervision.

To those of us most closely connected with investigation, and to the various safety engineers who have been consulted, the most significant feature is the three-dimensional effect secured by controlled color contrasts. The work in machines so treated stands out in stereoscopic clearness that cannot be achieved with brightness contrasts alone.

In the above investigation we have merely started the study of an unexplored phase of the problem of providing the best natural seeing conditions indoors.

The above data, while far from complete, do establish the fact that a suitable attention to color contrasts and brightness is essential if the best results are to be secured from any lighting system. Our investigators will undoubtedly establish the complete quantitative analysis of the problem with a greater degree of accuracy and precision.

# The LITERATURE Library

*A listing of data available, without cost, to help you in maintaining a health and safety program.*

### *Eye, Foot, Hand Protection—First Aid*

**No. 01—CORD-ON-END-SOLES—Pamphlet shows how looped cord-on-end structure makes soles more rugged and safe. Panther-Panco Co.**

**No. 02—FACE SHIELDS—Circular illustrates and describes 36 types of face shields for dust hazards, welding operations and general hazardous work. Boyer-Campbell Co.**

**No. 03—SPEED FRAME GOGGLE—Sheet points out goggle with automatic position feature. A simple nod of the head positions the goggles. Mine Safety Appliances Co.**

**No. 04—EYE PROTECTION—Eight page booklet lists a variety of goggles, lenses, spectacles and goggle accessories. Mine Safety Appliances Co.**

**No. 05—SKULLGARDS—4 page bulletin lists 7 different head protective products. Actual endorsements detailed. Mine Safety Appliances Co.**

**No. 06—EYE PROTECTION CATALOG—Outline indicates eye hazardous industries, operations and the type of goggle best suited to handle the problem. American Optical Co.**

**No. 07—"HOW TO FIT GOGGLES"—4 page bulletin tells how to fit goggles and gives tips for maximum performance. American Optical Co.**

**No. 08—GLOVES—Information on cowhide welding gloves. Double stitched and fully reinforced. American Optical Co.**

**No. 09—SAFETY SHOES—"The Whole Story" is the name of a 21 page booklet giving data on safety shoes, their application and use. International Shoe Co.**

**No. 010—KNEE PADS—Sheet illustrates knee pads to be used for those required to work in a kneeling position. Mine Safety Appliances Co.**

**No. 011—EYES ARE EXPENSIVE TARGETS—16 page booklet brings the matter of eye protection down to a dollars and cents story. Effective as a management tool. American Optical Co.**

**No. 012—TOP-SIDER SOLE—Sheet describes squeegee action of safety sole. Will grip any surface. Sperry Top-Sider Co.**

**No. 013—PACKAGED FOOT SAFETY PLAN—Liberally illustrated book gives full information about a new plan for the distribution of safety shoes. Thom McAn Shoe Co.**

**No. 014—SAFETY SHOE CATALOG—Is a complete buying guide to a broad selection of safety shoes. Full details on construction and recommendations for specific hazards are included. Lehigh Safety Shoe Co.**

**No. 015—FIRST AID KIT—4 page bulletin talks about dust proof and weather proof first aid kits. Contents of kits given. Mine Safety Appliances Co.**

**No. 016—SALT TABLETS—Pamphlet reprints article "Keeping in Condition by Using Salt." Prices and full details given. Morton Salt Co.**

**No. 017—EAR DEFENDERS—4 page booklet refers to ear defenders that reduce the sound level in noisy locations to about 1/10 of the former level. Points out possibility for greater efficiency. Mine Safety Appliances Co.**

### *Sanitation—Good Housekeeping*

**No. 100—INDUSTRIAL UNIFORM SERVICE—Pamphlet points out a plan whereby soiled garments are exchanged for freshly laundered ones at no inconvenience and with profitable results to the user. Cleveland Overall Co.**

**No. 101—SCOPE OF SANITATION—64 page book is a treatise on the many chemicals, products and equipment that provide for a sanitary, healthful plant. Handy guides are included. West Disinfecting Co.**

**No. 102—GROUP WASHING EQUIPMENT—Catalog No. 4010 details various kinds of washfountains, group showers, includes engineering layouts. Drinking fountains and properly planned washrooms also discussed. Individual bulletins on washroom layouts and pictorial applications also available. Bradley Washfountain Co.**

**No. 103—INDUSTRIAL DERMATITIS—40 page book includes a scientific report on industrial skin diseases. Products for prevention are outlined. Milburn Co.**

**No. 104—ATHLETE'S FOOT PREVENTIVE—Circular lists user experience with athlete's foot treatment and offers 60 day trial. Onox Co.**

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**No. 105—HAND CLEANER**—Pamphlet is a "question and answer" account of how this industrial cleaner is being used effectively by industry. Individual circulars for specialties are available. West Disinfecting Co.

**No. 106—FLOOR SCRUBBING MACHINES**—4 page bulletin describes a machine that scrubs, polishes, sands, etc., as interchangeable attachments are used. Hild Machine Co.

**No. 107—PAPER CUPS**—Information regarding the need for paper cups in industry. Free offer made. Lily Tulip Cup Corp.

**No. 108—FOOT POWDER**—Athlete's Foot powder is furnished in either white stainless form or a slight tracer form. Remains stable in solution. C. B. Dolge Co.

**No. 109—SKIN CLEANSER**—Generous free trial supply of industrial hand soap is made. Circulars containing specific information available. Sugar Beet Products Co.

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## *Plant Protection—Maintenance*

**No. 200—PLANT PROTECTION FOR DEFENSE**—Modernized manual of rules, regulations and instructive information to guide watchmen, guards and supervising personnel. Detex Watchclock Corp.

**No. 201—SLING CHAINS**—4 page catalog sheet details safe working loads, gives dimensions and offers a buying guide for sling chains. McKay Company.

**No. 202—INDUSTRIAL WIRE ROPE**—96 page catalog contains specific recommendations as to the constructions best suited for various types of cranes and industrial equipment. Broderick & Bascom Co.

**No. 203—FLOOR FINISH**—Catalog page describes penetrating floor finish that provides an attractive surface as well as preservation of the floor. Truscon Laboratories, Inc.

**No. 204—UNIT HEATERS**—36 page catalog points out the advantages of unit heaters, gives helpful engineering data including tables, illustrations and piping diagrams. Ilg Electric & Ventilating Co.

**No. 205—FLOOR MAINTENANCE**—30 page booklet refers to specific material that can be used for properly maintaining all types of floors. Thoroughly detailed and a valuable maintenance manual. West Disinfecting Co.

**No. 206—FLOOR PRESERVATION**—Literature on floor scrubbing machines indicating safety and maintenance features. Data on products such as waxes, finishes, etc. available. Finnell Co.

**No. 207—INDUSTRIAL VITAMIN PLAN**—Detailed account of how vitamin pills are now available to industry. User experience listed. Industrial Vitamin Corp.

## *Protection Against Dusts, Fumes, Gases*

**No. 300—DUST COLLECTING SYSTEMS**—Spiral bound book is both a word and picture presentation of industry's acceptance of skillfully engineered dust control systems. Various accessory equipment detailed. Kirk & Blum Mfg. Co.

**No. 301—VENTILATING EQUIPMENT**—Catalog page describes ventilating apparatus that is designed to remove various harmful fumes and vapors. Recorded air changes, diagrammatic sketches included. Autovent Fan & Blower Co.

**No. 302—INDUSTRIAL DUST CONTROL**—20 page book is a discussion of the basic principles applied to the solution of industrial dust problems. Inserted questionnaire can be used for individual cases. W. W. Sly Mfg. Co.

**No. 303—PORTABLE VACUUM CLEANING**—6 page bulletin points out the places where vacuum cleaners can be effectively used in industrial operations. Free demonstration available. Hild Machine Co.

**No. 304—AIRLINE RESPIRATOR**—Bulletin CS-6 points out use for an airline respirator with cartridge filter. Auxiliary attachments outlined. Mine Safety Appliances Co.

**No. 305—OXYGEN BREATHING APPARATUS**—Material descriptive of 2 hour, 1 hour, and ½ hour oxygen breathing apparatus that provides for various periods of respiratory protection. Bulletins are BB-1, BM-2, BC-2. Mine Safety Appliances Co.

**No. 306—FUME AND GAS INDICATORS**—Catalog sheets and bulletins referring to indicators for benzol, combustible gas, carbon monoxide and hydrogen sulphide. Recorders for oxygen, methane and electrostatic dust and fume sampler also have descriptive data. Mine Safety Appliances Co.

**No. 307—PURAIR HELMET**—4 page bulletin No. 97 describes a helmet particularly applicable in sand blast operations. W. W. Sly Mfg. Co.

**No. 308—DUST COLLECTORS**—Bulletin No. 903 describes engineering features available in this dust control equipment. Includes recommendations, specifications and list of users. Pangborn Corp.

**No. 309—QUESTIONS AND ANSWERS CONCERNING DUSTS**—16 pages of questions and answers are devoted to explaining in non-technical language the problems that continually arise regarding the nature and effects of dust. Mine Safety Appliances Co.

**No. 310—FANS AND BLOWERS**—Catalog 220 contains engineering data, pictures and details on multiblade fans. Literature on propeller fans, fans for high temperatures also. Garden City Fan.

**No. 311—VACUUM CLEANING**—"The Menace of Dust" is a circular that points out uses for heavy duty vacuum cleaning equipment in industry. Adjustments and tools for greater efficiency are discussed. U. S. Hoffman Machinery Corp.

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Slings—*from page 9*

**Iron Chain**

Iron hoisting chains are used in nearly all industries. These chains are subject to deterioration due to wear as well as embrittlement of material because of strains, shocks, or abuses. Unless the same care is given to the selection, care and use of these chains as is given to other material handling equipment, injuries to persons and damage to property may result. The making of reliable and satisfactory chains requires skill and the use of special manufacturing and testing equipment. It is therefore important that such chains be purchased from reliable manufacturers or through their jobbers.

The American Society for Testing Materials specify that iron chains for slings shall be made of wrought iron, free from any admixture of iron scrap or steel and that the manganese content shall not exceed 10%.

It is generally acknowledged that chain makes the safest sling for handling hot metal or working near acid. It is quite probable that chain slings are subjected to more abuse and neglect than any other form of materials handling equipment. The great wonder to me is that they don't fail oftener than they do. But they do fail often enough and from various causes. One characteristic of wrought iron chain is the natural elongation before failure. This elongation is a recognized warning sign that the sling needs attention.

This natural elongation before breaking can only be assured, as long as the metal is kept from becoming brittle. This brittleness is induced by cold working of the surface metal and is caused by the routine working of the chain over a period of time depending on how much the chain is used. The natural tensile strength is regained by certain heat treating methods. Another form of failure is failure in the weld. This may take the form of a separation of practically a new weld because of defective workmanship or it may occur in an old chain in which the welded surface goes through a progressive deterioration and oxidization.

Another form of failure may be due to repeated bending or deformation of the metal in the links. This type of failure is similar to that produced in an ordinary bar by repeated bending back and forth.

Fatigue failure is produced by a large number of repetitions of stress exceeding the fatigue limit of the metal. This type of failure is not very common in sling chains.

The only way I know of to insure reasonable safety in the use of iron chains is through a consistent and painstaking routine of inspections. A recommended inspector's routine is composed of the following points:

1. Encourage and train each man who uses a chain to give it a casual visual inspection each time he uses it.

2. Give every chain an official inspection at least once every month at which time check for elongation, weld separation fractures, signs of brittleness (generally indicated by a multitude of surface indentations accompanied by shininess), bent or fractured hooks or large rings, and inci-

dentally one of our main offenders in sling failure is the joiner links or the home-made links that join the factory made chain to the hooks and big ring. So watch these links closely.

3. A once-a-year program of getting every chain in the factory into the repair shop for a prescribed treatment. For chains that are in almost continuous usage this treatment may be required twice a year. A recommended treatment is as follows:

**Standard Routine for Maintenance of All Wrought-iron Chains**

| | *Periodic Repairs* | *Current Repairs* |
|---|---|---|
| 1. Clean in boiling OKite, platers cleaner or equivalent | x | |
| 2. Inspect for defects | x | x |
| 3. Repair any chain in need of repair or reject if not repairable | x | x |
| 4. *Heat in furnace until heated through to 1350 degrees Fahrenheit and cool in air | x | x |
| 5. Test on hydraulic tester to the following chart | x | x |

| *Diam. of Link in Inches* | *Test Pull in Tons* | *Diam. of Link in Inches* | *Test Pull in Tons* |
|---|---|---|---|
| 750 3/16 | 1/2 | 1 | 12 1/2 |
| 1/4 | 3/4 | 1 1/8 | 15 |
| 5/16 | 1 | 1 1/4 | 16 1/2 |
| 3/8 | 1 1/4 | 1 3/8 | 22 1/2 |
| 7/16 | 2 1/2 | 1 1/2 | 26 1/2 |
| 1/2 | 3 1/4 | 1 5/8 | 31 |
| 9/16 | 4 | 1 3/4 | 37 |
| 5/8 | 5 | 1 7/8 | 41 |
| 3/4 | 7 | 2 | 47 |
| 7/8 | 9 1/2 | | |

(Note: The above figures represent a safety factor of approximately 5 to 1.)

| | | |
|---|---|---|
| 6. Inspect each link for any failure | x | x |
| 7. Final Inspection and tag. | x | x |

* This heat-treat is the recommendation of a prominent chain company and the hand book on Metals.

Before we leave "iron chains" I would like to list a few "don'ts" for them:

1. Don't leave chains lying around in dirt and grease, have a rack on which to hang them and see that they are kept there when not in use. Incidentally, a properly constructed rack will facilitate periodic inspections and it is possible to construct the rack so that the crane man can hook on to and unhook from most chains without the assistance of a floor man.

2. Don't expect the chain user to guess at what the chain will safely hold; have each chain tagged with the safe load information.

3. Don't try to lift full load with a chain when it is at a very low temperature. Chains used outside in zero weather must always be *underloaded.*

4. Don't try to make your chains last too long. A new chain is cheaper than a new accident.

The National Safety Council's Safe Practices Pamphlet #98 for the safe and proper use of iron chain contains valuable information.

*Alloy Steel Chains*

This is something comparatively

new in the chain family but in the past three or four years it has been rapidly coming to the front. This chain is made from SAE 4620 steel and due to its nickel content has a high resistance to shock.

This resistance does not decrease until temperatures of 40 degrees below zero are reached. This nickel content also has the properties of retarding grain growth, refining the grain and increasing tensile strength and toughness. This steel also contains molybdenum which tends to eliminate brittleness. Some of the points which recommend this alloy-steel chain are:

1. The price is practically the same as iron chains.
2. Its safe load capacity is about 60 per cent higher than iron chain.
3. It is electric welded which eliminates bad welds and progressive weld failure.
4. It is hard and does not nick and pit up like the soft iron chain.
5. As it does not get brittle it does not require the periodic heat treatment as does iron chain.
6. It does not lose its efficiency under zero temperatures.

Unfavorable points might be summed up thus:

1. As it does not elongate this warning sign which sometimes occurs in iron chains prior to fracture is missing in alloy-steel chain. (It is questionable as to whether or not this absence of elongation is a liability; the consensus of experience with these chains is that they just don't fail.)
2. As they must be electric welded in all joints they are not quite so easy to make up as iron chain slings. (I am referring to the small shop who may have a blacksmith but no electric welder.)

It seems that these two points are about all that I can find that might be termed unfavorable to alloy-steel chain slings.

My firm has had some experience with these chains. About three years ago we started using a few of them on our tough, heavy jobs, since then we have been adding a few each year and we now have about 25 of them.

We are thoroughly sold on them. We have had positively no failures, they are handling our tough jobs satisfactorily. The alloy-steel chain was developed originally for the steel mill trade which is one of the toughest applications to which a chain can be put. They are now almost universal equipment throughout all the big steel mills.

For the small shop which is not equipped to make their own slings the chain manufacturer can make up anything they wish and at a fairly reasonable cost. This same chain company will also take care of chain repairs if any are needed.

For the big shops who like to make their own slings, partly from the economy standpoint and partly because when they want them they usually like to get them *right now*, I advise buying alloy-steel chain in running lengths, buying joiner links ready to weld, but making their own hooks and big rings.

These fittings should be made out of SAE 4620 Steel and should be made heavy enough to offset the fact that they may not be quite as good as factory-made fittings if both were standard size.

The inspection routine for alloy-steel slings is exactly as it is for an iron chain sling.

The list of "don'ts" for this type of sling is also the same as for an iron chain except I would add this one. Don't try to lift "the earth" with these chains, just because they can "take it" don't try to make them take it. Because this alloy steel chain is of such recent origin the National Safety Council has as yet no safe practices pamphlet on it.

**Wire Rope**

Slings made of wire rope are quite popular and are indeed very desirable for certain applications. The fact that its safety factor is usually very high and that its failure is so visably progressive makes it one of our most reliable slings for lifting very heavy loads where 100% safety is imperative.

Wire rope slings are generally made up in two styles of construction or design. The twisted type which is largely used for elevators, cranes, hoists, etc., but sometimes used for slings, and whose ends must be fastened with some form of splicing or clips, and the braided sling which employs endless ropes of opposite lays and requiring no splices or clips.

The twisted rope is best suited for slings when separate fittings, such as hooks, rings, clevises, etc., are used to connect to the load, although the rope alone may be used if the diameter of the part to be lifted is large enough so as not to cause abrupt bending of the wires in the rope. This abrupt bending around small diameters or sharp corners if repeated at about the same location on the rope will result in undesirable kinking and eventual failure.


**Greater Resistance To Sudden**

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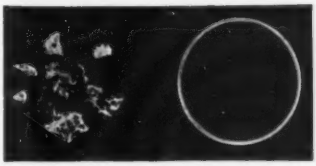

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In making splices or fastening loose ends for this type of rope it is customary to use U-bolt clips. It may not be common knowledge that there is a right and wrong way of attaching these clips. It has been definitely established, through tests that the U-clip has more holding power if the closed end of the U bears on the loose end of the rope, and there is a special safety clamp that is designed to hold the rope tighter and to conceal the loose ends of wires.

The braided sling of endless

weave with opposite lays is a much more flexible sling than one made of the conventional twisted rope and is made in both round and flat design. The popularity of this type of rope lies in the endless weave which eliminates splices and clips—which do sometimes slip—and the opposite lays which make for greater flexibility.

Like the twisted rope this braided rope is best applied when used for slings on which separate fittings are used. They also develop permanent kinks when consecutively strained around small diameters and sharp corners, although their inherent flexibility decreases this kinking to quite an extent.

Both twisted and braided ropes make much safer slings when bent around thimbles which will take the wear of the motion of the fittings. All wire rope slings require just as careful inspection and maintenance as any other type of sling. A recommended routine of inspection might be:

1. Encourage constant inspection by men who are using the slings.

2. An official inspection once a month or oftener in case of slings subjected to continual use, exceptionally hard service or jobs where 100% safety is imperative.

3. Scrap any sling where more than 25% of the wires are broken in any one place.

4. Scrap any sling that gets so "fuzzy" with short broken wire ends that it becomes a menace to hand safety.

5. Scrap any sling that has been under heavy load, while having a 360° kink in it.

6. Check condition of splices, clips, fittings, etc.

7. Check for extreme wear or corrosion.

A few "don'ts" that might apply on wire ropes are:

1. Don't leave slings around where they will collect dirt and grit. Have a place to hang them and see that they are kept there.

2. Don't attempt to use bare rope to lift on a highly polished precision surface, it may mar the surface.

3. Don't use rope around sharp corners without padding or blocking out. Wood blocks or sections of an old fire hose makes suitable protection.

4. Don't expect too long a service out of your wire ropes. If you get 75% of all you safely should have you'll still have received plenty.

There has been much informative material written about wire ropes but for a thorough sensible treatise on them I recommend to you National Safety Council's Safe Practices Pamphlet #26.

In closing this discussion, let me impress the fact that no matter what you lift, with manila rope, iron chain, alloy-steel chain or wire rope, there is dynamite in them if they are not up to par from a safety standpoint and only the most painstaking experienced vigilance will keep them that way.

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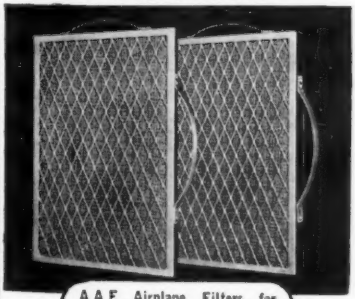
# AMERICAN AIR FILTERS FOR NATIONAL DEFENSE

Roto-Clone Grinding Bench with Airmat PL after cleaner for finishing airplane propellors.



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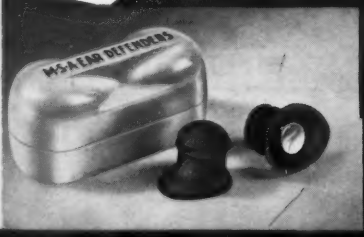


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